

The indication that claims 3, 8-10 and 12 contain allowable subject matter is noted with appreciation.

Claims 1, 2, 4-7 and 11 stand rejected as being anticipated by the newly cited U.S. Patent No. 5,414,280 to Girmay. This rejection is respectfully traversed for the following reasons:

1. Principal difference between Girmay and the Present Invention

1.1 Girmay

Girmay discloses a method to stabilize the optical output power of a laser diode which does not comprise any preparatory step; however, the operation of the laser diode is divided into two main procedures which are repeatedly performed in an alternating sequence:

First: Adjustment of the optical output power to some nominal value

This procedure comprises measuring of the optical output power by means of a photo detector (17) and generating a nominal value for the forward voltage which is considered to be a measure for the optical output power. It must be noted that this procedure is performed during operation of the stabilized laser

diode in the sense that the photo detector cannot be omitted from the operational circuitry.

Second: Operation of the laser diode for a limited time in a non-stabilized manner

This procedure comprises keeping the forward voltage of the laser diode at the constant nominal value determined during the first procedure by varying its forward current. This procedure does not involve any non-electrical quantities; however, it must be noted that it does not lead to any stabilization of the optical output power of the laser diode. Variations of the optical output power are smaller than if the laser diode were operated at a constant forward current but there is no process counteracting them. Long term stabilization is only achieved by limiting the time of non-stabilized operation and repeatedly performing the first step which does involve a non-electrical quantity.

1.2 Present Invention (Plamper et al.)

Applicants Plamper et al. disclose a method to stabilize the optical output power of a LED or a laser diode that is divided into a preparatory procedure, which is performed once, and the actual operation of the diode, which is a continuous process.

First: Preparatory determination of a relation between forward voltage and forward current which must be obeyed in order to obtain constant optical output power

This procedure also comprises measuring the optical output power and, in some cases, adjusting it to a desired value. However, the state established by this action is not maintained in order to operate the diode at once, but it is recorded in some manner in order to operate the diode later at a constant optical output power without having to measure this again. (The result of this procedure might also be that the diode must be operated at a constant forward voltage in which case it would be. However, all other cases are also taken into account).

Second: Operation of the LED or laser diode obtaining constant optical output power by obeying the aforesaid relation between forward voltage and forward current

This procedure comprises the process of continuously adjusting either forward voltage or forward current or both in order to compensate for deviations from the relation between them which was determined initially.

This process counteracts variations of the optical output power. It therefore causes a stabilization of the latter without ever having to repeat the first procedure again. So the diode can be operated in a stabilized manner for unlimited time and with no non-electrical quantities being involved. This in the true sense of no photo detector being included in the final circuitry.

2. Regarding Claim 1

Girmay does not disclose a method of stabilizing a laser diode by deriving a measure for its optical output power from its forward voltage and forward current, but rather a method which achieves stabilization only by repeated measurements of the optical output power by means

of a photo detector. Therefore, the rejection of claim 1 based on this reference is not justified.

The method steps of claim 1 are not anticipated by Figs. 2-4 of Girmay which point out the fact that changes of the optical output power due to changes of temperature at a constant forward voltage are considerably smaller than such at a constant forward current (see Col. 1, line 63, to Col. 2, line 3).

Fig. 3 of Girmay is an intermediate step used to derive the forward voltages corresponding to the current values shown in Fig. 2 in order to enter them into Fig. 4 (see Col. 1, line 66, to Col. 2, line 1). The optical output power can be determined either from the forward current using Fig. 2 or from the forward voltage using Fig. 4 but not from their combination. There is no combination of forward voltage and forward current at some given optical output power shown in Figs. 2-4. To do so, the intersections between the curves in Fig. 3 and those vertical lines which originate at the given output power on the corresponding curve in Fig. 2 would have to be connected, thus showing the relation between forward voltage and forward current which must be obeyed according to the present invention.

3. Regarding Claim 2

Applicants cannot comprehend why the circuit shown in Fig. 3 of Girmay should anticipate the method steps set forth in claim 2, which refers to obeying the required relation between forward voltage and forward current solely through electrical mechanisms. It is quite apparent that in the circuit according to Fig. 5 an optical quantity is involved because the circuit contains a photo detector. This is forbidden according to applicants' claim 2, so the circuit would not be of any use for what the claim refers to.

Moreover, Fig. 3 of Girmay merely shows the current voltage characteristics of a laser diode. These are properties of the given diode which can only be measured but not changed or even "implemented" regardless of what circuitry is used. The laser diode simply behaves at different temperatures as shown in Fig. 3; there is no implementation necessary.

4. Regarding Claim 4

The rejection of claim 4 based on Fig. 4 of Girmay is also not justified because the claim is related to a linear

correlation between voltage and current, not between voltage and optical output power. A straight line illustrating such a correlation would therefore have to be entered into Fig. 3, not into Fig. 4.

5. Regarding Claims 5-7

Constant voltage sources are incorporated in many electronic devices, including that of Girmay.

Girmay considers the use of a constant voltage source because of the fact that this would yield less instability of the optical output power than the use of a constant current source, when the laser diode is operated without any measures for stabilization. Girmay does not intend to keep the optical output power really constant by this technique.

Applicants' claims 5-7 refer to one common method of keeping the optical output power constant. According to claims 6 and 7, this can be done using a constant voltage source switched in series with an additional component of either positive or negative resistive behavior. Girmay does not consider any additional components at all, so claims 6 and 7 cannot be anticipated by this reference.

Applicants' claim 5 covers the special case of the resistive component mentioned in claims 6 and 7 having to exhibit a resistance of zero so it can simply be omitted. This case is a stringent consequence from the fact that a range of resistance which extends across positive as well as negative values must also contain the value zero. Claim 5 implies that there might be LED's or laser diodes which deliver constant optical output power when operated connected directly to a constant voltage source. Only such diodes are intended to be operated according to claim 5. All this is based on a consideration about the value of a series resistance and cannot be derived from the consideration of Girmay which does not include any series resistance at all.

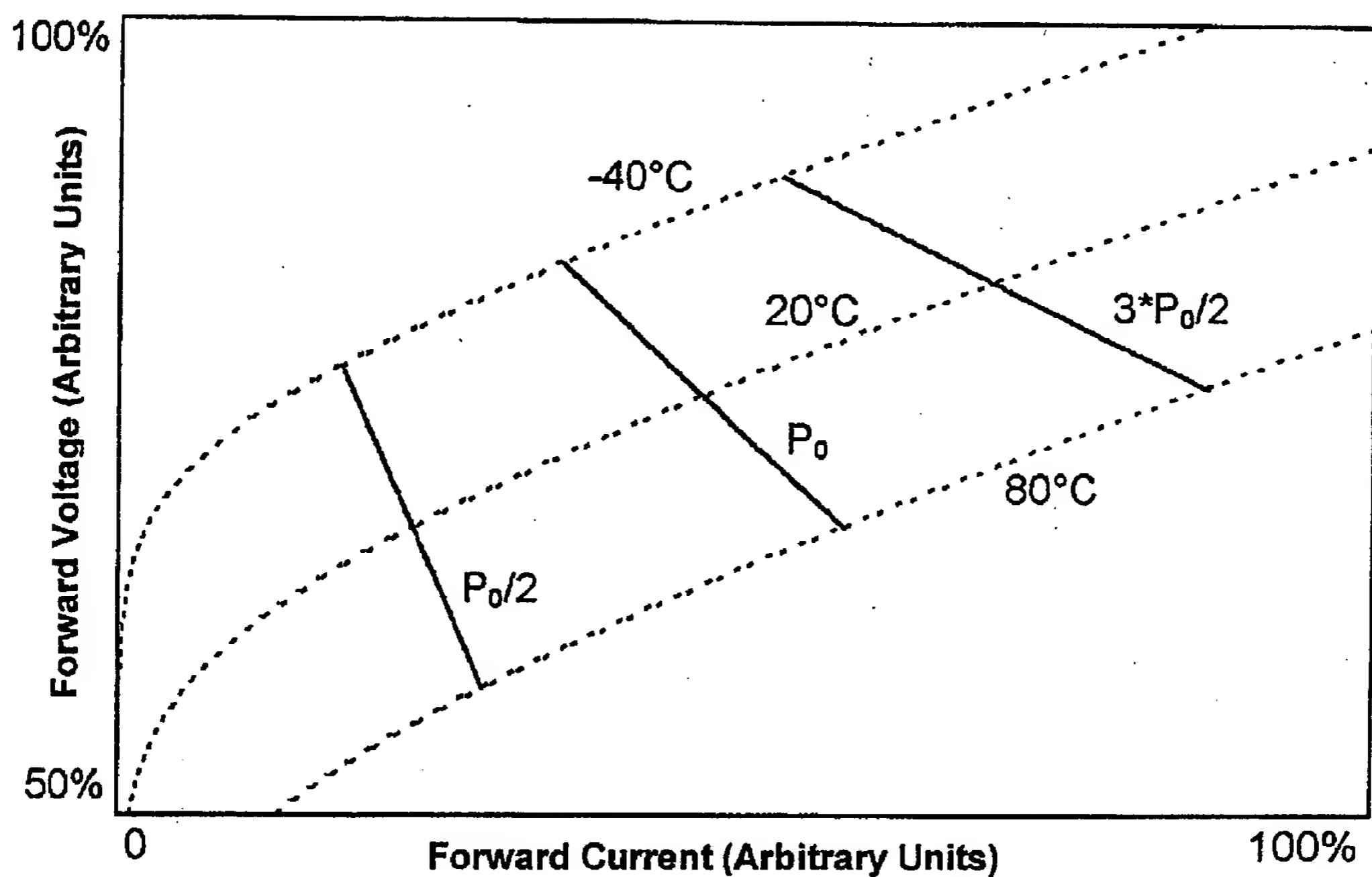
Even if a current source is considered a source of virtually infinite voltage in series with a virtually infinite series resistance, Girmay's consideration remains a comparison between two discrete extreme cases of series resistance for unstabilized operation of any laser diode. It does therefore not lead to the insight that stabilization of a LED or laser diode can be achieved by choosing some very particular value from a finite continuous range of

series resistance which also contains zero. That this special case leads to an implementation which was considered by Girmay before is a coincidence which does not allow the conclusion that the considerations leading to this common result can be derived from one another.

If Girmay claimed to achieve stabilization of a laser diode only by operating it at a constant forward voltage, applicants would agree that claim 5 would be anticipated. However, Girmay only uses this mode of operation as an intermediate step within a superordinate method. Consequently, claim 5, as well as claims 6 and 7, lead to implementations definitely not anticipated by Girmay because all three claims refer to a common method which is also clearly different from that of Girmay.

6. Regarding Claim 11

For convenience, one of the current voltage diagrams from this application is reproduced below.



The dotted lines show the normal current-voltage characteristics each semiconductor diode has. These are independent from whether the diode emits light or not.

Claim 11 refers to a method to determine the solid lines showing the relation(s) between forward voltage and forward current which must be obeyed to obtain constant optical output power(s). Lines of this kind are not entered into Fig. 3.

Applicants agree that in conjunction with Fig. 2 or Fig. 4, it would be possible to determine these relations as well. However:

First: This is not done in Fig. 3 and also doing so is not suggested by Girmay or anywhere else.

Second: This graphical method is different from the one claim 11 refers to. Here, a direct measuring method is suggested which includes maintaining the emitted light power at a constant level by means of some traditional control device.

Consequently, claim 11 is believed to be allowable because it refers to a method step Girmay not even suggests at all, not to mention the special way of performing it which is specified in claim 11.

7. Conclusion

Aside from their respective purposes, the teaching of Girmay and the present invention have two common aspects which might make them appear similar:

First: Both methods can be divided into two different main procedures or main method steps.

Second: Both methods include the use of a constant voltage source.

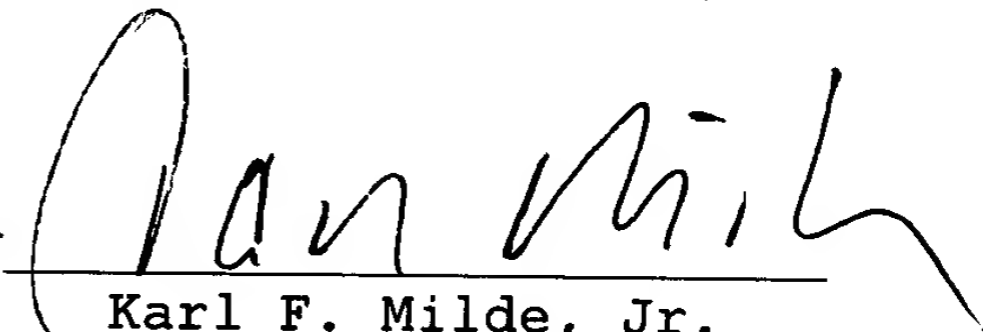
Regarding the first aspect, the tasks to be performed within said main procedures are completely different. Furthermore, their sequences over time are as different as can be: Comparing them is like comparing the B.C. and A.D. eras with the eternal alternation of day and night. Hence, this similarity is very superficial.

The second aspect even leads to an implementation which is explicitly specified. However, this common implementation emerges from different considerations, is intended to serve different purposes at different occasions and yields different results.

Accordingly, all the pending claims in this application, claims 1-12, are believed to distinguish patentably over Girmay as well as all the other references of record in this case. This application is therefore believed to be in condition for immediate allowance.

Respectfully submitted,

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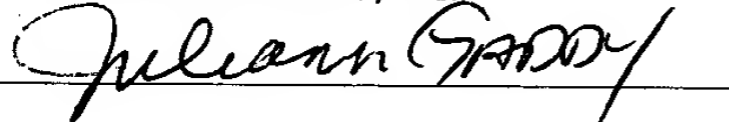
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By



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